UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
ANIMAL DISEASE ERADICATION DIVISION
FEDERAL CENTER BUILDING
HYATTSVILLE, MARYLAND 20781

REPORT OF COOPERATIVE TICK ERADICATION ACTIVITIES

Fiscal Year 1963

August 15, 1963

THE ERADICATION PROGRAM

Cattle fever ticks Boophilus annulatus and B. microplus spread bovine piroplasmosis--a severe and often fatal disease of cattle. It is also known as cattle tick fever, southern cattle fever, splenetic fever, and Texas fever.

Tick larvae hatch from eggs laid on the ground, become attached to animals occupying infested premises, feed upon the host animal--and thus transmit the disease--molt, mate, and the engorged female drops to the ground to deposit her eggs and thus the ticks are perpetuated.

An all-out eradication program was instituted in 1906. 37 years later, in 1943, the tick had been eradicated from the United States, except for a narrow buffer zone, under Federal and State quarantines along the Texas-Mexico border. There, reinfestations occur from time to time and an active program is required to prevent additional spread into adjacent areas. Reinfestations have also occurred in California and in Florida from time to time.

The eradication program includes inspection, quarantine, and dipping of infested animals.

PROGRAM GOALS

Prevention--keeping the ticks out of the United States--is a major part of the effort against cattle fever ticks. A quarantine zone is maintained along the international boundary and the lower Rio Grande River in 8 Texas counties as adjacent areas in Mexico are infested. Cattle from Mexico are carefully inspected for ticks at the border. They must be free of ticks and must be given a precautionary dipping before they can be imported.

Without these controls, cattle fever ticks would reinfest areas of the United States that have warm climates. In spite of continued efforts to keep out these parasites, they have reappeared from time to time, but vigilance and prompt eradication measures have eliminated the outbreaks.

Should the ticks gain a foothold, piroplasma-carrier cattle imported from Mexico could furnish reservoirs leading to heavy losses in our cattle population.

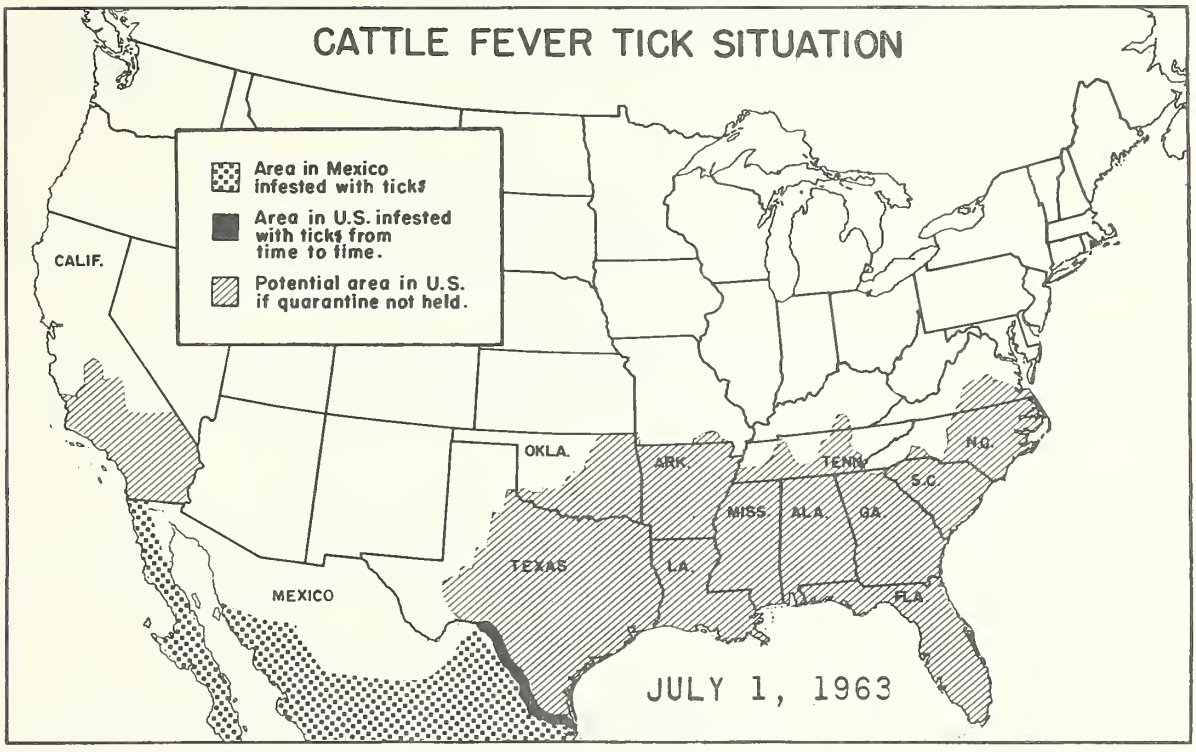
INSPECTIONS AND/OR DIPPINGS - FISCAL YEARS 1959 THROUGH 1963

Fiscal Years	Inspected and/or Dipped Herds	Inspected and/or Dipped Animals	Number of Infested Herds
1963	135,671	2,410,968	32
1962	181,764	2,397,944	21
1961	118,462	2,593,659	1
1960	104,554	1,685,283	20
1959	117,406	2,097,587	2

PROGRESS IN PUERTO RICO

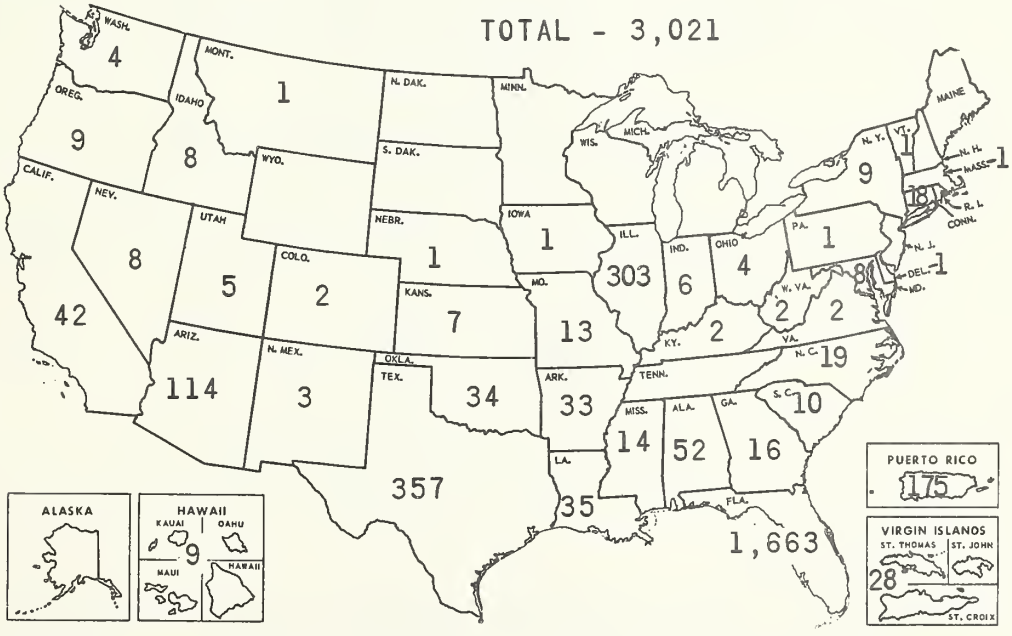
In Puerto Rico an active tick eradication program began in 1936. Here, the tropical variety of the fever tick, B. microplus, was prevalent and it was necessary to treat sheep and goats as well as equines and cattle, and to slaughter deer.

No cattle fever ticks have been found since December 1952. Systematic dippings were discontinued in May 1953 and systematic inspections discontinued in June 1954.



REPORT OF TICKS COLLECTED CALENDAR YEAR 1962

(Total Number Lots of Species From All Hosts)



During calendar year 1962, a total of 3,021 species lots of ticks were collected and identified. This was done in connection with the nationwide tick survey.

Collections were made from cattle, sheep or goats, horses or mules, dogs, and the following miscellaneous hosts: bobcat, bear, cat, deer, elk, fox, eland, human, coyote, moose, chicken, rabbit, snake, wolf, inanimate object, swine, and mongoose.

Included among tick collections were the folling: Amblyomma americanum, A. cajennense, A. dissimile, A. imitator, A. maculatum, Argas persicus, Boophilus annulatus, B. microplus, Dermacentor albipictus, D. nigrolineatus, D. nitens, D. occidentalis, D. variabilis, D. venustus Banks (='s D. andersoni Stiles), Haemaphysalis leporis-palustris, Ixodes angustus, I. cookei, I. pacificus, I. scapularis, Ornithodoros cooleyi, O. puertoricensis, Otobius megnini, and Rhipicephalus sanguineus.

A more detailed report has been compiled and was distributed previously.

FIELD EVALUATION OF ACARICIDES FOR SAFETY AND EFFECTIVENESS

During the year considerable attention was given to pesticides used in treatment of animals for external parasites. Better vat and dipping management was stressed, more laboratory support was developed, and additional work was done in regard to chemicals which do not create tissue residue problems.

Vat Management in the Absence of a Vatside Test

Maintaining the required concentration of acaricides in the absence of a vatside test requires careful technique and attention by the persons supervising the treatment of animals. Excessive concentration may poison or kill treated animals and may add tissue residue problems. Weak concentrations may not destroy all parasites and permit the spread of disease. The practice of using weak concentrations may also result in more resistant parasite populations.

ADE Division Memorandum No. 505.12, dated June 3, 1963, furnishes detailed information pertaining to vat management. Important aspects of the problem include accurate measurement of dipping vats using a water meter, mechanical agitation of the bath, precise replenishments, submission of bath samples for quantitative analysis, and, of course, considerable attention in regard to the chemical and formulation being used.

Water Meters Purchased for Field Use

In order that field vat supervisors have suitable meters available, 73 magnetic drive disc water meters reading in gallons were purchased for distribution to all States having need for them. These meters will provide considerable assistance in the interests of good vat management and increasing the safety and effectiveness of pesticides.

More Effective Laboratory Support

The Division Chemical Laboratory, Technical Services, Beltsville, Maryland, actively supported field activities, and quantitative analysis tests were conducted during fiscal year 1963 on samples as follows: Toxaphene - 2,292; Delnav - 29; Co-Ral - 97; Lindane - 355; and Korlan (Ronnel) - 97. Also, 12 series of emulsion stability tests were conducted.

Tissue residue studies for chlorinated hydrocarbons, organic phosphates, and arsenic were made on 5 tissue samples. Sufficient reagents were prepared to make 7,000 field tests for arsenic and lime sulphur. 132 samples of cresylic disinfectants were analyzed for compliance with specifications and the following other studies and miscellaneous sample determinations were conducted: PH - 126; Soda ash - 3; Nitrogen and phosphoric acid in bone meal - 4; Blood moisture - 2; Protein coagulation - 21; Urinary calculi, complete analysis - 1; and Wettable powder - 1. 16,043 test replications were involved in this work.

The increased production was the result of a change-over to modern instrumentation and procedures embodying physical and quantum mechanical as well as chemical principles.

Modern equipment added to the laboratory's analytical potential includes such instrumentation as infrared grating, and ultraviolet spectrophotometers, a flourometric photometer, automatic coulometric titrator, and particle size analyzer.

An investigation of the chemical and physical phenomena involved in the rapid depletion of lindane wettable powder in animal dipping is continuing.

Possible vatside test procedures for chlorinated hydrocarbons and organo-phosphate pesticides are in various stages of development.

In addition to providing for rapid qualitative checking of unknown samples, and accelerating quantitative analysis work, this equipment also provides for further study into the broad aspects of pesticide problems.

Cooperative Field Dipping Trials

Numerous field trials were conducted, using permitted dips and other products, to develop practical data for program use.

1. Vatside Tests for Emulsion Concentrates Not Satisfactory - Cooperative field trials in Arizona, Florida, Iowa, Missouri, and New Mexico had demonstrated previously that the vatside test availwas quite ineffective as a useful tool to maintain the concentrate of toxaphene emulsions in either cattle or sheep dipping operations. A similar vatside test also proved inadequate for maintaining the required concentration of Delnav emulsions when dipping cattle.

2. Satisfactory Replenishment Ratio Developed for Dipping Cattle in Toxaphene Permitted Dip - Cooperative field trials in Arizona, California, Idaho, New Mexico, and Utah demonstrated that when dipping cattle in permitted dips of toxaphene, an initial charging ratio of 1 gallon and 1 pint of toxaphene for each 150 gallons of water and a replenishment ratio of 1½ gallons of toxaphene for each 150 gallons of added water should maintain the proper acaricide concentration. Instructions to be followed in the treatment of cattle with permitted toxaphene dips are furnished in Supplement No. 2, dated February 7, 1963, of ADE Division Memorandum 505.1.

   Samples for quantitative analysis were also collected from spray-dip machines in Arizona, Colorado, and Idaho as cattle were being sprayed with toxaphene.

3. Additional Work Done to Establish Replenishment Ratio for Dipping Sheep in Toxaphene Permitted Dip - Supplement No. 3, dated April 10, 1962, to ADE Division Memorandum No. 505.1 furnishes instructions to be followed in the treatment of sheep with permitted toxaphene dips. Considerable effort was made in many States to improve vat management and dipping practices when dipping sheep.

   A great many bath samples taken from portable sheep dipping vats, private vats, and those at auction markets and public stockyards were submitted for quantitative analysis. States in which this work was done include Colorado, Illinois, Indiana, Iowa, Kansas, Kentucky, Minnesota, Missouri, Nebraska, North Carolina, North Dakota, Pennsylvania, South Dakota, Texas, Wisconsin, and West Virginia. The results of the quantitative analysis tests indicate that a change in the replenishment ratio is necessary and this is being done.

4. Cooperative Research and Field Trials Conducted in Mexico - Following extensive field trials held in Mexico in April, May, and June 1962, to test the efficacy of various chemicals against Boophilus ticks, additional trials in Mexico were held in November and December 1962. In the earlier work, experimental dipping involved arsenic, Korlan (Ronnel), delnav, and Co-Ral. The latter work was done in cooperation with the Entomology Research and Animal Inspection and Quarantine Divisions, ARS-USDA, and was planned to compare the efficacy of Co-Ral and arsenic against these ticks.

   In these trials arsenic, delnav, and Co-Ral were superior to Korlan when all four chemicals were used in recommended strengths. There were no deaths of treated cattle due to toxicity of the acaricides. Additional work is planned.

5. Disproportionate Carryout and Pesticidal Properties of Delnav - When using an acaricide for which there is no vatside test available, the disproportionate carryout of chemical and water must be accurately established in order that suitable replenishment procedures can be developed.

   Research work followed by cooperative field trials established that although the vatside test for delnav was unsatisfactory, a cattle dipping bath concentration of near 0.15 percent delnav could be maintained by charging the vat with a ratio of 1 gallon of delnav permitted dip to 200 gallons of water and using a ratio of 1 gallon of delnav for each 150 gallons of added water when replenishing.

   It was also established that delnav was an excellent tickicide. Unfortunately, delnav when used at a concentration of 0.20 percent dip was less effective against screwworm larvae than desired.

   In March and April 1963 a cooperative field trial was conducted in Pennsylvania to obtain additional knowledge concerning the effectiveness of delnav against psoroptic scabies mites and the disproportionate carryout problem when dipping sheep. This work indicated that a concentration of 0.20 percent delnav was maintained when a limited number (26) of infected sheep were dipped in a 150 gallon portable vat. The dipped animals showed no signs of toxicity. The vat was charged at a ratio of 1 gallon of permitted delnav emulsifiable concentrate to 150 gallons of water. The replenishment ratio was 1:100 gallons. Meticulous inspections of the infected sheep during the 30 days following dipping revealed that one dipping in a concentration of 0.20 percent delnav did not eradicate the psoroptic mites. This was disappointing from a tissue residue standpoint as animals dipped in delnav can be slaughtered for food purposes without a waiting period.

6. Disproportionate Carryout and Pesticidal Properties of Co-Ral - Research and cooperative field trials have established that Co-Ral is an excellent tickicide as well as being highly effective against screwworm larvae. Co-Ral is considered unique among wettable powders in that there seems to be little, if any, disproportionate carryout problems.

   Previously, in limited cooperative field trials in Wyoming and in Colorado in 1962 it appeared that when using a similar charging and replenishing ratio, cattle dipping baths could be maintained at a desired concentration.

   Field trials were conducted in Virginia and Maryland to learn if there is a disproportionate carryout problem when dipping sheep, if sheep can be dipped safely in 0.25 percent Co-Ral under field conditions, and whether Co-Ral is effective against psoroptic scabies mites under field trial conditions.

   On a Virginia farm, 54 sheep were dipped in a 120 gallon portable vat using a bath concentration of 0.25 percent Co-Ral. Quantitative analysis of bath samples indicated that a disproportionate carryout of chemical had not occurred. There was no indication of animal toxicity.

   In connection with sheep scabies schools held at Beltsville, Maryland, scabies-infected sheep were dipped as follows:

   One lot of eight infected sheep was dipped in a concentration of 0.125 percent Co-Ral, a lot of 7 was dipped in 0.24 percent, and a concentrate of 0.25 percent was used to dip a lot of 9 sheep. There was no evidence of animal toxicity. The results of meticulous post-dipping inspections were quite encouraging; however, an evaluation of the effectiveness of the dipping can't be made until both principal and control sheep are again inspected this coming winter.

OTHER REPORTS RECEIVED AND ACTIVITIES OF INTEREST

Tick Identification Training Courses Held in Texas

During August (13--17 and 20--24), September (24--28), and October (1--5), four one-week tick identification training courses were held at Laredo, Texas.

The courses were attended by 33 State and Federal employees from Louisiana, New Mexico, and Texas.

The purpose of the training was to provide basic instruction on the identification of cattle fever ticks (Boophilus annulatus and B. microplus) as well as other ticks common to southern United States and northern Mexico. Attention was also given to the principles of tick eradication including the inspection and dipping of animals and vat management procedures.

Five similar courses were held in Laredo in 1960 and were attended by Animal Disease Eradication Division, Animal Inspection and Quarantine Division, and State employees from Alabama, Arkansas, California, Florida, Georgia, Kentucky, Louisiana, Mississippi, New Mexico, New York, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and Washington, D. C.

Inspection Facility and Cattle Dipping Vat Plans Distributed

A three-page plan showing details of recommended cattle inspection facilities and a dipping vat was completed jointly by members of the Division and personnel of the Agricultural Engineering Research Division, ARS. The plans were printed and distributed to ADE stations. The prints will also be available in each State through the Cooperative Extension Service. These plans are a composite of a large number of plans reviewed and include the best features of all.

Increased Activities at ADE Division Parasite Reference Center

Procedures designed to increase the effectiveness of the nationwide livestock and wildlife tick survey are given in ADE Division Memorandum No. 510.19, dated April 17, 1963.

During fiscal year 1963, tick specimens totaling 2,383 were received and identified at the center. Also, 94 mite specimens and 71 miscellaneous parasite specimens were identifed. Of approximately 31,459 lots of suspected screwworm larvae received, some 27,314 were identified as screwworm and 4,459 as various species of blow fly larvae.

Additional Information Concerning Cattle Fever Ticks (Boophilus microplus) Developed in the Virgin Islands

Insofar as an eradication program is concerned, deer play an important part as hosts of cattle fever ticks in the Virgin Islands. Dr. Robert L. Park, USDA Animal Husbandman, developed information that larval ticks obtained as a result of incubating eggs from engorged female ticks removed from cattle would develop fully on deer, and that the eggs from such engorged female ticks maturing on deer would hatch.

Supervised Treatment of Animals With Pesticides

ADE Division Memorandum No. 505.11, dated September 21, 1962, instructed Division employees not to supervise the treatment of animals in other than permitted dips. Employees were also instructed to issue certificates for animals properly treated with a permitted dip and to endorse the certificate as specified in ADE Division Memorandum No. 505.1, and supplements thereto.

REPORTS OF EQUINE PIROPLASMOSIS IN FLORIDA AND GEORGIA

The first laboratory confirmed diagnosis of equine piroplasmosis in the United States was made in Florida in August 1961. As of June 30, 1963, the disease had been diagnosed on 98 Florida premises affecting 140 horses. Four cases had been laboratory confirmed in a Georgia herd. The diagnosis in Georgia was made on October 18, 1962, and was the first known incidence of the disease outside of Florida and is believed limited to one premises in Coffee County.

Equine piroplasmosis is caused by Babesia caballi or Nuttallia equi and is fatal to between 5 and 50 percent of the animals infected. Those animals which make an apparent recovery occasionally have relapses when under stress. Infected animals usually remain carriers. In the absence of a test capable of identifying the carrier state, all equines once infected must be treated as carriers and possible spreaders of the disease.

World-wide, at least fifteen species of ticks have been incriminated or proven to be vectors of the disease. Of these, at least two are definitely present in the United States: Rhipicephalus sanguineus, the brown dog tick, and Dermacentor nitens, the tropical horse tick.

The tropical horse tick (Dermacentor nitens) is a one-host tick. It was first reported in Jamaica and Santo Domingo in 1897; later in Argentina, Columbia, Central America, Mexico, Cuba, Haiti, and Trinidad. Heavy infestations were found in the ears of horses in Texas as early as 1907.

Unconfirmed evidence indicates the presence of the tropical horse tick in Florida in 1947; however, it was not positively identified until 1958. Evidence of its role in the transmission of EP in the United States is circumstantial. Until the vector or vectors of equine piroplasmosis are identified and eradicated, all biting arthropods are suspect.

Detection of equine piroplasmosis is difficult, as there is no diagnostic test. Reliance is placed on finding the protozoa in the red blood cells. The parasites are most common in the peripheral circulation from the second to the fifth day following appearance of symptoms. Thereafter, they gradually disappear. After death, the organisms may be found more readily in smears made from spleen, liver, and kidneys.

Recommended controls for the disease include vector control, precautions against mechanical transmission, prompt reporting, and control of infected animals.

Research work and field trials are being conducted by the Entomology Research Division in Florida and in Mexico. In this work, the effectiveness of several tickicides is being evaluated.

EXOTIC TICKS FOUND ON AN IMPORTED RHINOCEROS

An employee of Catskill Game Farm, Catskill, New York, found two ticks, later identified as Amblyomma hebraeum, in the ear of a rhinoceros imported in the United States in August 1962. Apparently, these two male ticks were dead when collected.

A review of the importation disclosed that there had been two recent importations by ship of rhinoceroses from the Umfolozi Game Reserve in Zululand. A shipment of five had arrived during late August. Of these, three went to the Washington Park Zoo, Milwaukee, Wisconsin, and two to the Chicago Zoological Park in Chicago, Illinois. A group of six arrived in early September--two going to the New York City Zoological Gardens, two to the San Diego, California Zoological Gardens, and two to the Catskill Game Farm. The ticks were collected from one of the latter.

Rhinoceroses are among the exotic animals not required by Department regulations to be routinely inspected and treated for ticks. It is understood that these rhinoceroses had been sprayed with an acaricide during the course of their importation. Efforts were made for official inspection and treatment of the tick-exposed rhinoceroses.

A. hebraeum (the Bont tick) is found chiefly on cattle but may infest most warm-blooded domestic and wild animals. It is a vector of heartwater. The larvae and nymphs pick up the rickettsiae while feeding on an infected host. It is believed the rickettsiae are limited to the epithelial cells and lumen of the tick's alimentary canal and that transovarial transmission of the disease does not occur.

The Catskill Game Farm had been placed under quarantine in 1960 following the finding of Rhipicephalus evertsi ticks on recently imported zebras. The quarantine was lifted following eradication of the ticks.

Exotic ticks had previously, in September 1956, been found infesting a rhinoceros at the Dallas, Texas Zoo and Aquarium. The ticks were identified as Amblyomma gemma and Hyalomma spp.

ACTIVE PROGRAM CONTINUES IN TEXAS

All territory in Mexico adjacent to the international boundary along the lower Rio Grande River is tick-infested, and reinfestations in Texas by ticks carried by Mexican animals illegally entering the United States occur regularly. The river, serving as the boundary, is not an effective barrier against such illegal movements. A buffer area, under Federal and State quarantine, extends from Del Rio to the Gulf of Mexico, approximately 500 miles. This zone is constantly patrolled by Department inspectors who, in cooperation with Texas livestock sanitary authorities, work diligently to reduce the introduction and prevent the dissemination of the ticks. The area under quarantine includes parts of Cameron, Hidalgo, Kinney, Maverick, Starr, Val Verde, Webb, and Zapata Counties.

SPECIAL TICK SURVEY ALONG RIO GRANDE RIVER

In July and September 1962, live cattle fever ticks were collected from two stray Charolais bulls found approximately four miles north of the area under State and Federal tick quarantines. An intensive survey made by four inspectors during April, May, and June 1963 did not reveal any additional infestation. The Amistad dam, scheduled for completion in 1967, will form a reservoir extending some 80 miles above Del Rio, Texas, and should then aid materially in preventing animals from straying from Mexico into the area concerned.

BOOPHILUS TICKS FOUND OUTSIDE QUARANTINE AREA

During routine inspection of a suspected case of "ringworm" affecting a calf at an auction market in Gregg County, Texas, two dead immature ticks were collected. The ticks were subsequently identified in Texas and at Beltsville, Maryland, as Boophilus. Epidemiological studies traced the shipment of which the calf was a part to Louisiana where 1,930 cattle and 18 horses belonging to 20 owners were inspected. No additional Boophilus ticks were found.

REPORT OF ACTIVITIES IN BUFFER AREAS

FISCAL YEARS 1959 THROUGH 1963 AND IN 1952

Illegally Entering Mexican Livestock Caught	1963	1962	1961	1960	1959	1952
Equine - tick-infested	122 - 4	120 - 9	61 - 2	41 - 3	15 - 0	1,873 - 183
Cattle - tick-infested	139 - 41	59 - 26	17 - 8	50 - 21	15 - 5	147 - 82
Sheep and Goats - tick-infested	1 - 0	5 - 0	1 - 0	1 - 0	0 - 0	0 - 0
American Livestock Straying to Mexico and Returning	51 - 0	17 - 0	8 - 0	31 - 0	8 - 0	7 - 0
Inspected for Ticks						
Systematic Area						
Herds	49,080	42,298	35,269	35,380	30,955	32,363
Livestock	1,381,195	926,872	739,959	741,286	690,307	558,809
Final Area						
Herds	16,695	14,879	15,653	12,771	13,067	12,011
Livestock	344,814	297,304	293,830	304,590	292,309	168,088
Dipped for Ticks						
Systematic Area						
Herds	11,847	10,424	10,382	9,556	9,918	13,845
Livestock	88,518	56,655	58,201	52,743	51,706	81,685
Final Area						
Herds	606	641	529	382	340	113
Livestock	2,815	2,184	4,950	1,047	1,209	1,323
Intrastate Certificates Issued						
Number of Certificates	14,556	14,023	13,046	12,435	12,206	14,913
Number of Livestock	188,732	123,257	83,952	76,659	28,268	57,704
Interstate Certificates Issued						
Number of Certificates	67	65	66	172	312	13
Number of Livestock	8,134	7,205	12,668	21,390	14,511	808
Herds Held for Further Treatment						
Systematic Area	48	14	5	17	3	92
Final Area	0	0	4	4	0	0
Tick-Infested Herds Found						
Systematic Area	38	21	1	4	2	29
Final Area	1	0	0	0	0	1
Exposures to Clean Premises	68	16	25	17	4	108
Re-exposures to Held Premises	3	5	1	4	0	73